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Indian Standard

GENERAL REQUIREMENTS FOR
STEEL DROP, UPSET AND
PRESS FORGINGS

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

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Indian Standard

GENERAL REQUIREMENTS FOR STEEL DROP, UPSET AND PRESS FORGINGS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 24 March 1966, after the draft finalized by the Steel Forgings Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 forgings are used in the production of various components to impart the desired grain structure and also to impart fibre strength in the most suitable direction to withstand service stresses. With the growing demand for forgings in the country, a standard covering the general requirements will be useful. Requirements other than those given in this standard may be specified for special components and such requirements shall be laid down in the respective standards.

0.3 This standard contains clauses **4.6, 7.1, 8.1, 10.1, 13.1, 14.1** and **14.1.1** which permit the purchaser to use his option for selection to suit his requirements.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the general requirements for steel components or parts manufactured by the technique of drop, upset or press forgings.

2. SUPPLY OF MATERIAL

2.1 General requirements relating to the supply of material shall be as laid down in IS : 1387-1959†.

*Rules for rounding off numerical values (*revised*).

†General requirements for the supply of metals and metal products.

3. TERMINOLOGY

3.1 For the purpose of this standard, definitions of forging terms as given in IS : 1956-1962* shall be applicable.

4. MANUFACTURE

4.1 Steels for forgings shall conform to IS : 1570-1961†.

4.2 Forgings may be manufactured from dressed billets and in such cases the supplier shall ensure that the condition in which the forgings are supplied is satisfactory.

4.3 Amount of hot working and finishing temperature shall be such as to ensure complete soundness and adequate uniformity of structure and mechanical properties. The forgings shall not be overheated.

4.4 Forgings shall be finished to shape and size by hot-working, and shall, where practicable, be so worked as to cause metal flow in the direction most favourable for resisting the service stresses where these are known. When specified in the order, the supplier shall submit, for the approval of the purchaser, a sketch showing the shape of the rough forging before machining and the supplier may also be required to show, by sectioning and etching a representative forging that soundness and a satisfactory grain flow have been obtained.

4.5 With certain steels, special precautions after hot-working are necessary and in such cases the supplier shall ensure that the condition in which the steel is supplied is satisfactory.

4.6 Descaling of forgings by any approved method shall be subject to agreement between the supplier and the purchaser.

5. WORKMANSHIP

5.1 Forgings shall be free from any harmful surface defects.

6. HEAT TREATMENT

6.1 Forgings may be supplied in the as forged, normalized, annealed or hardened and tempered conditions as agreed to between the supplier and the purchaser. The heat treatment shall be suitably conducted to impart the required physical properties. If a forging is subsequently heated for any purpose, it shall be reheat-treated.

*Glossary of terms relating to iron and steel.

†Schedules for wrought steels for general engineering purposes.

7. TOLERANCES

7.1 forgings shall normally be manufactured in accordance with the tolerances specified in IS : 3469*. In special cases, tolerances shall be agreed to between the supplier and the purchaser.

8. SELECTION OF TEST SAMPLES FOR PHYSICAL TESTS

8.1 For forgings with ruling sections equivalent to a diameter greater than 28 mm, integral test samples may be provided subject to mutual agreement between the supplier and the purchaser. In that case a prolongation shall be made on an agreed portion of forgings. Unless agreed otherwise, the prolongation shall have a ruling section approximately equal to that of the forging and it shall be heat-treated similarly and simultaneously with the forging it represents.

8.2 Where integral test samples are not required and for small forgings with ruling section equivalent to a diameter of 28 mm or less, separate test samples shall be provided from the bars or billets from which forgings are made. They shall be forged to the ruling section of the forgings and shall be heat-treated similarly and simultaneously with the forgings they represent.

8.3 The number of tests shall be as specified in the respective material standard.

8.4 Unless specified otherwise, the axis of the test samples shall be located at any point midway between the centre and the surface of solid forgings and at any point midway between the inner and outer surface of the wall of hollow forgings and shall be parallel to the axis of the forgings in the direction in which the metal is most drawn out.

9. PHYSICAL TESTS

9.1 Tensile Test — Tensile test shall be carried out in accordance with IS : 1608-1960†. The test piece shall be machined lengthwise from each test sample. The tensile properties shall conform to the requirements specified in IS : 1570-1961‡.

9.2 Bend Test — Bend test shall be carried out in accordance with IS : 1599-1960§. The degree of bend and the diameter of the former through which the test piece is to be bent shall be as laid down in the respective material standard.

*Tolerances for steel drop, upset and press forgings and forged bars (*under preparation*).

†Method for tensile testing of steel products other than sheet, strip, wire and tube.

‡Schedules for wrought steels for general engineering purposes.

§Bend test for steel products other than sheet, strip, wire and tube.

9.3 Impact Test — In case of special forgings and wherever it is stated either in the contract or in the drawing, izod impact test shall be carried out on each test sample. Impact test shall be carried out on test piece machined lengthwise from each sample in accordance with IS : 1598-1960*.

9.4 Hardness Test — Hardness test, where required, shall be carried out either in accordance with IS : 1500-1959† or IS : 1501-1959‡.

10. DECARBURIZATION

10.1 Decarburization shall be kept to minimum. The limit of decarburization shall be subject to mutual agreement between the supplier and the purchaser.

11. OPTIONAL TESTS

11.1 Subject to mutual agreement between the supplier and the purchaser, tests other than those specified in 9 shall be carried out.

12. RETEST

12.1 Should any of the original test pieces fail to pass physical tests specified in respective material standards, two further samples shall be selected for retest for each of the test sample that fails. One of the test samples shall be taken from the forging from which original test sample was taken unless that forging has been withdrawn by the manufacturer.

12.2 The mechanical properties obtained from the test pieces prepared from the two further test samples shall comply with the specific requirements. Should either of the test pieces fail to meet the specific requirements, the material represented shall be liable to rejection except that the supplier may reheat-treat the forging or forgings represented and re-submit it for testing. No forging shall be reheat-treated more than twice.

13. SURFACE CONDITION

13.1 The forgings may be supplied in any one of the following surface conditions, subject to mutual agreement between the manufacturer and the purchaser:

- a) As forged,
- b) Machined, and
- c) Treated.

*Izod impact test for steel.

†Method for Brinell hardness test for steel.

‡Method for Vickers hardness test for steel.

14. MARKING AND PACKING

14.1 Unless agreed otherwise between the manufacturer and the purchaser, each forging shall be clearly marked with the following information.

- a) Manufacturer's name or trade-mark,
- b) Steel designation, and
- c) Identification mark by which it can be traced to the cast of steel from which the forging was made.

14.1.1 The material may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

14.2 Packing and despatch of forgings shall be subject to agreement between the manufacturer and the purchaser.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Conversion
Force	newton	N	1 N = 1 kg.1 m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

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